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ABSTRACT

A study examined the performance of the High Schools That Work (HSTW) initiative in 1996 and 1998, based on data from the HSTW Assessments. Analyses found support for the hypothesis that HSTW is the cause of school improvement, although other non-measured factors may also influence these schools, and showed that between 1996-98 HSTW schools significantly increased percentages of students in their senior classes who met the HSTW achievement goals in mathematics, science, and reading and who completed the HSTW-recommended program of study. Evidence indicated many HSTW practices were being implemented and supported the hypothesis that meeting the HSTW curricular standards is related to meeting the achievement goals. Increases in the use of best instructional practices, in vocational teachers' emphasizing using academic skills for vocational assignments, in the amount of time students spend on homework, and in the percentages of students who receive help from the school in developing a four-year educational plan were related to an increase in percentage of students' meeting achievement goals. Analyses showed schools that had an increase in percentage of students who took a mathematics or science course in senior year had an increase in percentage of students completing the HSTW curriculum in those academic areas. Teacher indicators are appended. (Contains 10 figures and 13 tables.) (YLB)

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High Schools That Work: Findings from the 1996 and 1998 Assessments

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***High Schools That Work*:**
Findings from the 1996 and 1998 Assessments

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INTRODUCTION

Founded by the Southern Regional Education Board (SREB) in 1987, *High Schools That Work (HSTW)* is a comprehensive school-reform initiative that combines challenging academic courses and modern career/technical studies to raise the achievement of career-bound high school students (Bottoms, 2000). Career-bound students are the 60 to 65 percent of high school youths who plan to work, attend a two-year technical or community college, enroll in a four-year college or university with an open admission policy or enter the military after high school graduation. The initiative's goal is to improve the communication, mathematics, science, technical and problem-solving skills of career-bound youths.

HSTW is built on the belief that students following general and career/technical programs of study can master complex academic and technical concepts if schools create an environment that encourages students to make the effort to succeed (Bottoms, 2000). *HSTW* focuses special attention on career-bound youths because these students have not had access to a rigorous academic curriculum (SREB, 1998). *HSTW*'s intent is to increase the achievement of these students to prepare them for further learning or careers.

The *HSTW* framework brings together school and district leaders, teachers, students, families, and community and state leaders in a collaborative effort to create a more challenging and meaningful high school program of study (SREB, 1998). *HSTW* articulates actions to improve student achievement and provides technical assistance to assist schools in developing and carrying out a school improvement plan. The actions that guide schools are:

- Set clear whole-school goals aimed at improving student achievement.
- Use the *HSTW* framework of key practices to create a vision of school improvement.
- Participate in the *HSTW* Assessment.
- Create a structure for involving staff, students, parents and business leaders in continuous planning to improve student learning.

- Obtain support from district and school leaders to make quality instruction and support for teachers a priority by providing extensive staff development, time for teachers to work and plan together, and resources to implement change (SREB, 1998).

The *HSTW* initiative began in 1987 with 28 schools; it now includes more than 1,100 schools in 26 states. It is one of the initiatives listed in a report from the Northwest Regional Educational Laboratory (NREL) on the Comprehensive School Reform Demonstration program, which provides funds for states to use in grants to local school districts to implement school-reform programs (NREL, 2000). Unlike many school-reform programs, *HSTW* has shown evidence of successful outcomes for students. In a research report that examined 24 major school-reform programs, *HSTW* was one of only three programs that had strong evidence of positive effects on student achievement and one of only 12 programs that provided strong support to schools (American Institutes for Research, 1999).

HSTW Initiative

To assist schools in developing an educational environment that affirms the ability of all students to learn high-level academic and technical concepts, *HSTW* suggests a recommended program of study and key practices for accelerating student achievement. *HSTW* recommends replacing the general-education track, which *HSTW* developers believe fails to prepare students adequately for work or further education (Bottoms, 2000). The U.S. Department of Education (1994) reports that students in the general track of most high schools do not meet the typical college-entry requirements, nor do they complete an adequate number of credits in a specific vocational labor market. Career-bound students in *HSTW* are expected to meet both of these challenges. The *HSTW*-recommended courses blend the essential content of college-preparatory mathematics, science and language arts courses with modern career/technical studies in grades nine through 12 (Bottoms, 2000). The *HSTW*-recommended curriculum consists of:

- At least four credits in English courses with the content and performance standards of college-preparatory English;

- At least three credits in mathematics, including two credits in courses with the content and performance standards of college-preparatory Algebra I, geometry, Algebra II and trigonometry;

- At least three credits in science, including two credits in courses with the content and performance standards of college-preparatory biology, chemistry, physics or applied physics; and

- At least four credits in an academic or a career/technical major.

In addition to completing an upgraded academic core, career-bound students "major" in either a broad technical field of study or further academic studies. By requiring students to earn four credits in a concentration, high schools hold students to higher intellectual and technical standards in that area. The U.S. Department of Education (1994) reports that vocational education students who concentrate their vocational education in one area and find jobs related to their training have higher earnings than those who take lower-level courses in multiple areas.

HSTW also recommends 10 key practices that schools should implement to accelerate student achievement. The practices include having high expectations for all students, giving all students access to intellectually challenging academic and career/technical studies, engaging students in their studies, and giving students extra help with their schoolwork..(See Table 1.) By implementing the key practices, schools should be able to increase the number of students taking the recommended courses and improve student achievement.

HSTW's aim is to improve student achievement. Every two years, *HSTW* schools administer the *HSTW* Assessment, which is based on the National Assessment of Educational Progress (NAEP). In these assessments, seniors in *HSTW* schools take hour-long achievement tests in mathematics, science and reading. The *HSTW* performance goals are scores of 295 in mathematics, 292 in science and 279 in reading. Schools in the *HSTW* network also administer surveys to students and teachers to ask about their educational/teaching experiences.

Table 1. ***High Schools That Work*'s 10 Key Practices**

Key Practices
High Expectations: Set higher expectations and get career-bound students to meet them.
Vocational Studies: Increase access to challenging vocational and technical studies, with a major emphasis on using high-level skills in the context of modern workplace practices and in preparation for continued learning.
Academic Studies: Increase access to academic studies that teach the essential concepts from the college-preparatory curriculum by encouraging students to use academic content and skills to address real-world projects and problems.
Program of Study: Have students complete a challenging program of study with an upgraded academic core that includes four years of college-preparatory English and three years each of mathematics and science (at least two years in each area equivalent to college-preparatory courses).
Work-based Learning: Give students and their parents the choice of a system that integrates school-based and work-based learning. The system should span high school and postsecondary studies and should be planned by educators, employers and employees.
Teachers Working Together: Implement an organizational structure that provides academic and vocational teachers the time to plan and provide integrated instruction aimed at teaching high-level academic and technical content.
Students Actively Engaged: Get every student involved in rigorous and challenging learning.
Guidance: Involve each student and his or her parents in a guidance and advising system.
Extra Help: Provide a structured system of extra help to enable students who may lack adequate preparation to complete an accelerated program of study that includes high-level academic and technical content.
Keeping Score: Use student assessment and program evaluation data to improve continuously the school climate, organization, management, curricula and instruction to advance student learning and to recognize students who meet both curriculum and performance goals.

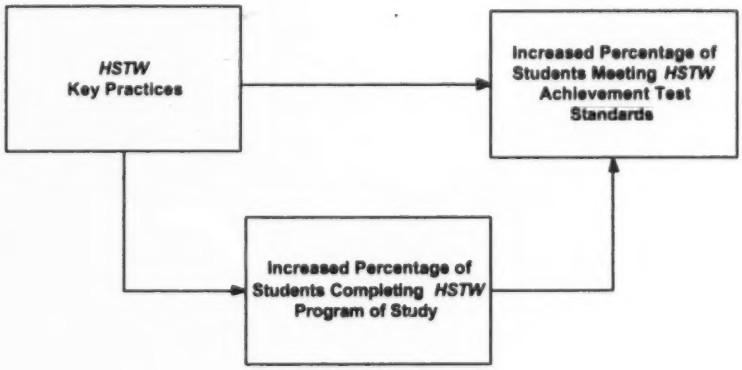
After participating in the assessment, each school receives a report that contains the school's results from the current and previous assessments. These reports enable school staff to chart their progress in improving the academic and technical performance of students. School leaders and staff use

the assessment information in revising instruction, graduation requirements, curricula, guidance practices, extra-help systems and work-based learning programs (Bottoms, 2000). The reports contain information on students' scores on the achievement tests and course-taking patterns, as well as students' responses to individual survey items. The reports also contain group scores that enable a school to compare its results to other groups, such as 1) students at high-scoring schools that are demographically similar to the school, 2) students at all high-scoring *HSTW* sites, 3) students in the NAEP national vocational sample, and 4) students in the NAEP national sample of college-preparatory students (Bottoms, 2000).

Conceptual Model

In this study we are interested in two measures of student achievement: 1) the percentage of students who meet *HSTW*'s goals on the NAEP-based achievement tests in mathematics, science and reading, and 2) the percentage of students who complete *HSTW*'s rigorous program of study. (See Figure 1.) Increasing the number of students who meet the goals on these tests is a major aim of *HSTW*. We hypothesize that the second measure of achievement, the percentage of students who complete *HSTW*'s rigorous program of study, will affect the first measure of achievement, performance on achievement tests, as shown in the conceptual model. Theoretically, students who complete the rigorous program of study will have higher performance on the achievement tests than those who do not. (This hypothesis is tested in this paper.)

Figure 1. Conceptual Model


HSTW
Key Practices
Increased Percentage of Students Meeting HSTW Achievement Test Standards
Increased Percentage of Students Completing HSTW Program of Study

Our conceptual model depicts the manner in which we hypothesize that the *HSTW* model affects schools and students. We propose that schools' higher levels of implementation of the *HSTW* key practices will lead directly to more students' meeting the *HSTW* standards on the achievement tests. In addition, we propose that implementation of the *HSTW* key practices will also lead indirectly to more students' meeting the *HSTW* standards on the achievement tests through an effect on the percentage of students that complete the *HSTW*-recommended program of study. If the model is effective in the way it is supposed to be, we should find the proposed relationships.

Research Questions

The purpose of this report is to examine the performance of the *HSTW* initiative in 1996 and 1998, based on data from the *HSTW* Assessments in these years. We asked these specific questions:

- What was the level of student achievement in *HSTW* schools in 1996?
- Were there changes in student achievement between 1996 and 1998?
- What was the level of implementation of the key practices in 1996?
- Were there changes in the level of implementation of the key practices between 1996 and 1998?
- What was the relationship between implementation of the key practices and student achievement?

Overview of the Study

We conducted analyses using *HSTW*'s assessment data for 1996 and 1998 to examine the effects of participation in *HSTW* on schools and students. The assessment data were originally collected with the intent of providing specific information to individual schools, not with the intent of studying the *HSTW* initiative as a whole. However, we believe that these data can be useful to create a basic picture of the *HSTW* initiative and to address the research questions listed above. This report and similar research are especially important due to the small amount of research in the area of comprehensive school reform. While there is substantial literature on theories of school reform, there is a need for research on the effectiveness of specific reform approaches.

To confirm whether *HSTW*'s key practices existed in schools, we examined representative indicators to assess the initiative's implementation level in schools. In addition, we examined the effect of this implementation on student achievement. However, all of the key practices are not represented in this study because the assessment data does not fully represent all of the key practices.

Thus, we were only able to find indicators measuring seven of the 10 key practices. (See Table 2.) These measures by no means represent all aspects of a key practice – only those that were readily available from the assessment data.

Table 2. Key Practices with Representative Indicators from the Surveys

Key Practices	Measures (Source)
High Expectations: Set higher expectations and get career-bound students to meet them.	• School Expectations for Vocational Students (teacher survey) • Importance Placed on Encouraging Student Success (teacher survey) • Supportive Instructional Environment (teacher survey)
Vocational Studies: Increase access to challenging vocational and technical studies, with a major emphasis on using high-level skills in the context of modern workplace practices and in preparation for continued learning.	• Vocational Teachers Stress Academic Skills (student survey) • Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments (student survey) • Administrators' Expectations that Vocational Teachers Will Integrate Academics into Their Classes (teacher survey)
Academic Studies: Increase access to academic studies that teach the essential concepts from the college-preparatory curriculum by encouraging students to use academic content and skills to address real-world projects and problems.	• Use of Best Instructional Practices in Mathematics Courses (student survey) • Use of Best Instructional Practices in Science Courses (student survey) • Use of Best Instructional Practices in English Courses (student survey) • Teacher Emphasis on Basic Learning Skills (teacher survey) • Use of Mathematics in an Applied Context (student survey) • Use of Science in an Applied Context (student survey)

Key Practices	Measures (Source)
Program of Study: Have students complete a challenging program of study with an upgraded academic core that includes four years of college-preparatory English and three years each of mathematics and science (at least two years in each area equivalent to college-preparatory courses).	• Percentage of Students Who Completed the *HSTW* Program of Study in Mathematics, Science and English (student survey) • Percentage of Students Who Took Mathematics in Their Senior Year of High School (student survey) • Percentage of Students Who Took Science in Their Senior Year of High School (student survey)
Teachers Working Together: Implement an organizational structure that provides academic and vocational teachers the time to plan and provide integrated instruction aimed at teaching high-level academic and technical content.	• Academic and Vocational Teachers Meet as a Team (teacher survey)
Students Actively Engaged: Get every student involved in rigorous and challenging learning.	• Increase in Use of Best Instructional Practices Since Beginning *HSTW* (teacher survey) • Amount of Time Students Spend on Homework Each Day (student survey)
Guidance: Involve each student and his or her parents in a guidance and advising system.	• Percentage of Students Who Receive Help from Their School in Developing a Four-Year Educational Plan (student survey)

METHODS

Data

High Schools That Work schools gather data for the student assessment and program evaluation through the *HSTW* Assessment every two years. The assessment consists of three components: 1) a student survey for career-bound students; 2) a teacher survey; and 3) student achievement tests in mathematics, science and reading. The student survey focuses on high school academic and vocational classroom experiences, course-taking patterns, and work experiences of career-bound students. Students participate in the assessment as seniors; to be eligible, they must have completed at least four credits in a planned sequence of vocational courses. The teacher survey includes questions on school climate, expectations for students, teacher efficacy, students' skills, changes since the school joined *HSTW*, and teachers' use of time.

Students take hour-long NAEP-based achievement tests in mathematics, science and reading. *HSTW* has established performance goals for students in these three areas, along with an explanation of skills that are indicated by meeting each goal. The test score for the mathematics goal indicates that students can apply their understanding of mathematical operations and notation to interpret expressions and solve a variety of problems, including some multi-step problems in algebra and geometry. It also indicates that students can to read and use instruments, interpret data from a variety of graphs, and find the probability of a simple event. The test score for the science goal indicates that students can interpret the results of science experiments and can determine the appropriateness of an experimental design. It also indicates that students can demonstrate an understanding of key principles from the physical and life sciences; apply knowledge, skills and reasoning abilities to interpret scientific and technical data from simple tables; and make inferences about results of experimental procedures. The test score for the reading goal indicates that students can demonstrate an overall understanding and interpretation of what they read; make connections between what they read and their personal experiences and draw conclusions; and use information to perform tasks and follow directions (Bottoms, 2000).

For some analyses we divided the schools into two groups: 1) new *HSTW* schools and 2) experienced *HSTW* schools. New *HSTW* schools completed their first *HSTW* assessment in 1996,

while experienced *HSTW* schools completed their first *HSTW* assessment in 1994 or earlier. Compared with experienced schools, new schools might show more change in between 1996 and 1998 because, unlike new schools, experienced schools may have fully or partially implemented many of the key practices by the time of the 1996 assessment.

Sample

Of the total number of schools participating in *HSTW*, 393 schools collected student and teacher data as part of the *HSTW* Assessments in both 1996 and 1998. We used the data from these schools in our analyses. These data represent the responses of 18,373 students in 1996 and 19,244 students in 1998 and 14,363 teachers in 1996 and 14,685 teachers in 1998. (See Table 3.)[1] About 30 percent of the students in these schools were non-white and about 80 percent had parents who had completed at least a high school education. (See Table 4.) The majority of teachers were female and white; at least half of them had earned a master's degree or higher. (See Table 5.)

Table 3. Number of Participants in the Sub-sample of Schools that Participated in *HSTW* in Both 1996 and 1998

	1996	1998
Number of students	18,373	19,244
Number of teachers	14,363	14,685

Table 4. Characteristics of Students in the Sub-sample of Schools that Participated in *HSTW* in Both 1996 and 1998

	1996	1998
Percentage of female students	52	52
Percentage of non-white students	30	29
Percentage of mothers with a high school education or higher	80	82
Percentage of fathers with a high school education or higher	77	79

[1]This study is not longitudinal, so the students who participated in the study in 1996 are not the same students who participated in the study in 1998. Some of the same teachers may have participated in the study in both years, but since the study does not track individual participants, we do not know the number of teachers who participated in both years.

Table 5. Characteristics of Teachers in the Sub-sample of Schools that Participated in *HSTW* in Both 1996 and 1998

	1996	1998
Percentage of academic teachers (versus vocational teachers)	68	70
Percentage of female teachers	61	62
Percentage of teachers over age 40	63	63
Percentage of non-white teachers	18	18
Percentage of teachers with a master's degree or higher	54	52

Analyses

Our analysis of data from the biennial assessment involves indicators that represent many aspects of the *HSTW* key practices. These indicators include data gathered from both the teacher and the student surveys. Some indicators consist of student or teacher responses to a single survey question. Other indicators consist of multi-item scales that include student or teacher responses to several survey questions. We used multi-item scales instead of individual questions (where possible) as a data reduction technique in these analyses, since many questions in each survey represent a similar aspect of the same key practice. Each multi-item scale combines information from several questions that represent similar information. We then assessed each scale for internal consistency: If a scale has a high internal consistency score, respondents tended to answer these questions similarly. (See Appendix A for a list of the individual items and the multi-item scales.) Individual survey questions that had low internal consistency with a multi-item scale were deleted from that scale. We divided one multi-item scale – school climate – into two sub-scales for ease of presentation and interpretation. These two sub-scales were used separately for all analyses except for the final regression analyses, which used the overall school climate scale. After scale creation, the individual student and teacher data were aggregated into school-level data. All analyses were conducted at the school level. All analyses used either teacher or student data, but no analyses included both data sets.

The questions from the student and teacher surveys measure specific aspects of some of the key practices, but not the entire key practice. Therefore, throughout the rest of this paper we will refer

to both the individual survey questions and the multi-item scales that we use as "indicators," since they each represent only one aspect of one of the *HSTW* key practices. The following list shows the seven indicators that we used from the teacher survey. (We note whether each is an individual item or a multi-item scale.)

- School Expectations for Vocational Students (individual item);
- Importance Placed on Encouraging Student Success (multi-item scale);
- Supportive Instructional Environment (multi-item scale);
- Administrators' Expectations that Vocational Teachers Will Integrate Academics into Their Classes (multi-item scale);
- Teacher Emphasis on Basic Learning Skills (multi-item scale);
- Academic and Vocational Teachers Meet as a Team (individual item); and
- Increase in Use of Best Instructional Practices Since Beginning *HSTW* (multi-item scale).

The next list shows the 11 indicators that we used from the student survey. (We note whether each is an individual item or a multi-item scale.)

- Vocational Teachers Stress Academic Skills (multi-item scale);
- Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments (multi-item scale);
- Use of Best Instructional Practices in Mathematics Courses (multi-item scale);
- Use of Best Instructional Practices in Science Courses (multi-item scale);
- Use of Best Instructional Practices in English Courses (multi-item scale);
- Use of Mathematics in an Applied Context (individual item);
- Use of Science in an Applied Context (individual item);
- Percentage of Students Who Took a Mathematics Course in Their Senior Year of High School (individual item);
- Percentage of Students Who Took a Science Course in Their Senior Year of High School (individual item);
- Amount of Time Students Spend on Homework Each Day (individual item); and
- Percentage of Students Who Receive Help from Their School in Developing a Four-Year Educational Plan (individual item).

To answer the research questions, we examined changes in student achievement as well as changes in school practices. We used paired t-tests to determine whether student achievement (achievement test scores and course-taking patterns) changed significantly from 1996 to 1998. We also used paired t-tests to compare the levels of program implementation in 1996 and 1998. Finally, we tested our causal hypotheses regarding the influence of changes in implementation of the *HSTW* key practices on changes in student achievement (test scores and course-taking patterns) using multi-variate linear regression.

RESULTS AND DISCUSSION

The results of our analyses are organized by the research questions.

What Was the Level of Student Achievement in *HSTW* Schools in 1996?

What percentages of students met the *HSTW* achievement goals on the NAEP-based tests in 1996 and 1998? In 1996, 48 percent of the students met the *HSTW* goal for the mathematics achievement test, 51 percent for the science achievement test, and 42 percent for the reading achievement test. (See Table 6.) In 1998, 59 percent of the students met the *HSTW* goal for the mathematics achievement test, 55 percent for the science achievement test, and 50 percent for the reading achievement test. The *HSTW* goal is to have 85 percent of students meet the achievement goals.

Table 6. Percentages of Students Who Met *HSTW*'s Goals on the NAEP-Based Achievement Tests in 1996 and 1998

NAEP-Based Test	1996	1998
Mathematics (N = 392)	48%	59%
Science (N = 392)	51%	55%
Reading (N = 392)	42%	50%

What percentages of students completed the *HSTW*-recommended program of study in 1996 and 1998? In 1996, 64 percent of students met the *HSTW* standard for a rigorous program of study in mathematics, 37 percent for a rigorous program of study in science, and 32 percent for a rigorous program of study in English. (See Table 7.) In 1998, 79 percent of students met the *HSTW* standard for a rigorous program of study in mathematics, 51 percent for a rigorous program of study in science, and 38 percent for a rigorous program of study in English. Students were most likely to complete the program of study in mathematics, followed by science and then English. The *HSTW* goal is to have all students complete a rigorous program of study.

Table 7. Percentages of Students Who Met *HSTW*'s Program of Study in 1996 and 1998

Recommended Program of Study	1996	1998
Mathematics (N = 390)	64%	79%
Science (N = 389)	37%	51%
English (N = 389)	32%	38%

Were There Changes in Student Achievement Between 1996 and 1998?

What were the changes in the percentages of students who met the *HSTW* achievement goals on the NAEP-based tests between 1996 and 1998? For mathematics, science and reading, a significantly higher percentage of students met *HSTW*'s achievement goals in 1998 compared with 1996.[2] An average of 11 percent more students per school met the mathematics goal; an average of four percent more students per school met the science goal; and an average of eight percent more students per school met the reading goal. These results show that schools in the *HSTW* network are successfully increasing the number of students who meet the *HSTW* goals (although this type of analysis cannot determine whether this increase is related to participation in *HSTW* or to other factors).

What changes occurred between 1996 and 1998 in the percentage of students who completed the *HSTW* program of study? The second measure of student achievement is completion of a rigorous program of study. For all three academic subjects, a significantly higher percentage of students completed *HSTW*'s program of study in 1998 compared with 1996.[3] In mathematics an average of 15 percent more students per school completed the program of study; in science an average of 14 percent more students per school completed the program of study; and in English an average of 6 percent more students per school completed the program of study. These results show that schools in the *HSTW* network successfully increased the number of students who completed the *HSTW* program

[2]These differences were all significant at the $p \leq .001$ level. These differences also existed when new and experienced sites were analyzed separately (at the $p \leq .01$ level).

[3]These differences were all significant at the $p \leq .001$ level. These differences also existed when new and experienced sites were analyzed separately (at the $p \leq .05$ level).

of study (although this type of analysis cannot determine whether this increase is related to participation in *HSTW* or to other factors).

Key points on student achievement. At this point, we have covered the first two research questions of this report: 1) What was the level of student achievement in *HSTW* schools in 1996 and 2) Were there changes over time in student achievement? The results show that between 40 and 60 percent of students met the *HSTW* achievement goals on the NAEP-based tests in 1996 and 1998, compared with the goal of having 85 percent of students meet these goals. Over the two-year period there were significant increases in the percentage of students who met the NAEP-based test goals in all three academic areas. There was an especially large increase (11 percent) in the area of mathematics.

In terms of the *HSTW* program of study, a fairly high percentage of students met the goal in mathematics (64 to 79 percent), with more moderate percentages of students meeting the goal in science (37 to 51 percent) and English (32 to 38 percent). Over the two-year period *HSTW* schools showed increases in the percentages of students who completed the recommended program of study, with especially large increases in mathematics (15 percent) and science (14 percent).

What Was the Level of Implementation of the Indicators in 1996?

What was the level of implementation of the indicators of the key practices for new *HSTW* sites in 1996? To answer this question we used data from the teacher and student surveys to examine the degree to which schools were able to implement some indicators of the *HSTW* key practices. For these analyses, we separated new and experienced schools. We expect experienced schools to have higher levels of implementation of the indicators compared with new schools, because the new schools have had less time to implement these indicators.

According to teacher surveys, where did new *HSTW* schools stand on the indicators in 1996? The average levels of implementation reported for new schools in 1996 showed that about the time schools entered the *HSTW* program they met the goals or were close to meeting the goals for three of the seven indicators measured from the teacher survey. (See Table 8.) Experienced *HSTW* schools met the goals for the same three indicators. Teachers in new *HSTW* schools reported::

- Practices that encourage student success were more than important ($M = 3.32$ on a 1-4 scale where 3, the goal, represents *important*). Experienced schools had an average of 3.35.
- They agree somewhat that their school engages in practices that create a supportive instructional environment ($M = 2.97$ on a 1–4 scale where 3, the goal, represents *agree somewhat).* Experienced schools had an average of 3.06.
- They emphasize basic learning skills often ($M = 2.99$ on a 1–4 scale where 3, the goal, represents *often).* Experienced schools had an average of 3.05.

Table 8. Teacher Reports on Levels of Implementation of Indicators in *HSTW* Schools in 1996

Indicators from Teacher Surveys (Higher Score = Better Implementation. See Appendix A.)	New Sites 1996 (N = 223)	Experienced Sites 1996 (N = 170)	Goal
School Expectations for Vocational Students	2.08	2.15	3
Importance Placed on Encouraging Student Success	3.32	3.35	3 or higher
Supportive Instructional Environment	2.97	3.06	3 or higher
Administrators' Expectations that Vocational Teachers Will Integrate Academics in Their Classes	2.82[4]	3.02[5]	4
Teacher Emphasis on Basic Learning Skills	2.99	3.05	3 or higher
Academic and Vocational Teachers Meet as a Team	2.05	2.10	4 or higher
Increase in Use of Best Instructional Practices Since Beginning *HSTW*	3.41	3.53	4 or higher

However, as Table 8 also shows, both new and experienced *HSTW* schools fell short of the goals on four of the indicators in 1996. For these indicators, teachers in new *HSTW* schools reported:

- Their school did not expect vocational students to meet the same academic standards as college-preparatory students ($M = 2.08$ on a 1–3 scale where 3, the goal, represents expecting vocational students to *meet the same standards* in academics that are expected of students planning to directly enter a four-year college, and a score of 2 represents that the school only expects vocational students to master the academic content needed for further study in a work or educational setting). The average for experienced schools was 2.15.

[4] N = 220

[5] N = 169

- School administrators expected vocational teachers to integrate academics into their classes to some extent[6] ($M = 2.82$ on a 1–4 scale where 3 represents *to some extent* and 4, the goal, represents *a great deal*). Experienced schools had an average of 3.02.

- Academic and vocational teachers met about once a year to plan collaborative instructional activities ($M = 2.05$ on a 1–5 scale where 2 represents *once this year* and 4 or higher, the goal, represents *once per week*). Experienced schools had an average of 2.10.

- Schools had not met the goal for increasing their use of best instructional practices since becoming *HSTW* sites ($M = 3.41$, on a 1–5 scale where 3 represents *no change* and the goal is 4 or higher). Experienced schools had an average of 3.53.

Thus, the results show that while schools were implementing three of the seven indicators at or close to the goal levels in 1996, increased implementation was needed for the four remaining indicators.

According to student surveys, where did schools stand on the indicators in 1996? The average levels of implementation of the indicators reported by students reveal that both new and experienced schools had not yet met the goals for any of these indicators, although they were close to meeting the goals for some of them. (See Table 9.) The results showed other student indicators that needed higher levels of implementation. Specifically, in new schools:

- Vocational teachers stressed academic skills more than seldom ($M = 2.29$ on a 1–3 scale where 2 represents *seldom stressed* and 3, the goal, represents *often*). Experienced schools had an average of 2.31.

- Vocational teachers emphasized using academic skills to complete vocational assignments less than monthly or several times a year ($M = 2.78$ on a 1–4 point scale where 3 represents required *monthly or several times a year* and 4, the goal, represents required *daily or weekly*). Experienced schools had an average of 2.85.

- Mathematics teachers used an average of 2.45 out of 7 best instructional practices frequently enough, where the goal is to use 4 best instructional practices frequently enough. (Mathematics teachers in experienced schools used an average of 2.56 instructional practices frequently enough.)[7]

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[6] This question was asked of vocational teachers only.

[7] The goal for mathematics is to use 4 out of 7 instructional practices frequently enough.

- Science teachers used an average of 2.81 out of 5 best instructional practices frequently enough, where the goal is to use 3 best instructional practices frequently enough. (Science teachers in experienced schools used an average of 2.89 instructional practices frequently enough.)[8]
- English teachers used an average of 3.01 out of 5 best instructional practices frequently enough, where the goal is to use 3 best instructional practices frequently enough. (English teachers in experienced schools used an average of 3.04 best instructional practices frequently enough.)[9]
- Mathematics was used in an applied context once or twice a year (M = 1.96 on a 1–4 scale, where 3, the goal, represents *daily or weekly*). Experienced schools had an average of 2.02.
- Science was used in an applied context more than once or twice a year (M = 2.28 on a 1–4 scale, where 3, the goal, represents *daily or weekly*). Experienced schools had an average of 2.33.
- Forty-five percent of students took a mathematics course in their senior year of high school (the goal is 100 percent). Forty-eight percent of students from experienced schools took a mathematics course in their senior year of high school.
- Thirty-three percent of students took a science course in their senior year of high school (the goal is 100 percent). Thirty-five percent of students from experienced schools took a science course in their senior year of high school.
- Students spent less than one hour on homework each day (M = 1.62, where 2, the goal, represents spending *at least one hour* on homework each day). Students in experienced schools had an average of 1.62.
- Sixty-two percent of students received some help from the school in developing a four-year plan (the goal is100 percent). Sixty-eight percent of students in experienced schools received help.

[8] The goal for science is to use 3 out of 5 instructional practices frequently enough.

[9] The goal for English is to use 3 out of 5 instructional practices frequently enough.

Table 9. Student Reports on Levels of Implementation of Indicators in *HSTW* Schools in 1996

Indicators from Student Reports Higher Score = Better Implementation (See Appendix A.)	New Sites 1996 (N = 223)	Experienced Sites 1996 (N = 170)	Goal
Vocational Teachers Stress Academic Skills	2.29	2.31	3
Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments	2.78	2.85	4
Use of Best Instructional Practices in Mathematics Courses	2.45	2.56	7
Use of Best Instructional Practices in Science Courses	2.81	2.89	5
Use of Best Instructional Practices in English Courses	3.01	3.04	5
Use of Mathematics in an Applied Context	1.96	2.02	3
Use of Science in an Applied Context	2.28	2.33	3
Percentage of Students who Took a Mathematics Course in Their Senior Year of High School	45	48	100
Percentage of Students who Took a Science Course in Their Senior Year of High School	33	35	100
Amount of Time Students Spend on Homework Each Day	1.62	1.62	2 or higher
Percentage of Students Who Received Help from Their School in Developing a Four-Year Educational Plan	2	68	100

Were There Changes in the Level of Implementation of the Indicators Between 1996 and 1998?

According to the teacher surveys, did the level of implementation of the indicators change between 1996 and 1998? The fourth research question is whether schools increased their implementation of the indicators between 1996 and 1998. In this comparison, we expected new schools to show improvement in more key practices than experienced schools. Any improvement shown by the new schools is not likely to have been incorporated until the 1998 implementation levels were measured and will emerge as differences between 1996 and 1998 in these analyses. On the other hand, the initial improvement in levels of implementation at the experienced schools would have been incorporated into their 1996 levels of implementation; thus, compared with the new schools, there would not be as large a difference between the 1996 and the 1998 levels of implementation.

The new schools in the initiative showed small but statistically significant improvement on six out of seven indicators reported by teachers between 1996 and 1998. (See Table 10.) In these two years, teachers from new *HSTW* schools reported that schools:

- increased their standards for vocational students relative to college-preparatory students;
- became more encouraging of student success;
- created a more supportive instructional environment;
- increased expectations from administrators that vocational teachers incorporate academics into their classes;
- increased teachers' emphasis on basic learning skills; and
- increased the use of best instructional practices since beginning *HSTW.* (SeeTable 10.)

Table 10. Changes in Levels of Implementation of the Indicators in New *HSTW* Schools Between 1996 and 1998: Teacher Reports

Indicators from Teacher Reports Higher score = better implementation (See Appendix A.)	New Sites (N = 223)		Goal
	Average 1996	Average 1998	
School Expectations for Vocational Students	2.08	2.21***	3
Importance Placed on Encouraging Student Success	3.32	3.37***	3 or higher
Supportive Instructional Environment	2.97	3.02***	3 or higher
Administrators' Expectations that Vocational Teachers Will Integrate Academics in Their Classes	2.82[10]	2.94***	4
Teacher Emphasis on Basic Learning Skills	3.15	3.17*	3 or higher
Academic and Vocational Teachers Meet as a Team	2.04	2.01	4 or higher
Increase in Use of Best Instructional Practices Since Beginning *HSTW*	3.41	3.55***	4 or higher

***$p \leq .001$, *$p \leq .05$. Probability values of paired t-tests.

[10] N = 220

The experienced schools improved implementation on three of seven indicators reported by teachers between 1996 and 1998. (See Table 11.) In these two years, teachers from experienced *HSTW* schools reported that they:

- increased standards for vocational students relative to college-preparatory students;
- became more encouraging of student success; and
- increased the use of best instructional practices since beginning *HSTW*.

Table 11. Changes in Levels of Implementation of the Indicators in Experienced *HSTW* Schools in 1996 and 1998: Teacher Reports

Indicators from Teacher Reports Higher score = better implementation (See Appendix A.)	Experienced Sites (N = 170)		Goal
	Average 1996	Average 1998	
School Expectations for Vocational Students	2.15	2.21***	3
Importance Placed on Encouraging Student Success	3.35	3.38*	3 or higher
Supportive Instructional Environment	3.06	3.06	3 or higher
Administrators' Expectations that Vocational Teachers Will Integrate Academics in Their Classes	3.02	3.00	4
Teacher Emphasis on Basic Learning Skills	3.19	3.19	3 or higher
Academic and Vocational Teachers Meet as a Team	2.10	2.00***	4 or higher
Increase in Use of Best Instructional Practices Since Beginning *HSTW*	3.53	3.59***	4 or higher

$p \leq .001$,$p \leq .05$. Probability values of paired t-tests.

Of the other indicators, for new schools, the frequency with which academic and vocational teachers met as a team did not change between 1996 and 1998. For experienced schools, the levels of implementation remained the same for three indicators:

- Whether the school engages in practices that create a supportive instructional environment;
- The amount administrators expect vocational teachers to integrate academics into their classes; and
- Teachers' emphasis on basic learning skills.

The implementation levels did not decrease for any indicators in new schools. For experienced schools, the levels of implementation decreased only for the frequency with which academic and vocational teachers met as a team.

We should be careful when interpreting the meaningfulness of these increases; although they are statistically significant, they are fairly small. The results indicate that while most of the key practices were changing in the right direction, the changes have been slow, and perhaps should be examined over a longer period of time to see whether the speed or magnitude with which these particular indicators are implemented increases over time. Also, these changes represent the average change; factors not included in these analyses may be related to schools making changes slower or faster than the average rate.

These results show that overall, *HSTW* schools increased their implementation of some of the indicators as reported in the teacher survey by a small amount between 1996 and 1998. As expected, new schools showed increases in implementation of the key practices in more areas than did experienced schools. The implementation level of some key practices remained the same for some indicators and decreased for other indicators between 1996 and 1998.

According to student surveys, did the level of implementation of the indicators change between 1996 and 1998? Using student data, we continue to examine the fourth research question – whether schools increased their implementation of the key practices between 1996 and 1998. Again, we expected new schools to show improvement in more key practices than experienced schools.

The new schools in the initiative improved on seven of the 11 indicators reported by students between 1996 and 1998. (See Table 12.) Experienced schools showed improvement on six of the 11 indicators. (See Table 13.) *HSTW* schools in 1998:

- increased the degree to which vocational teachers emphasized using academic skills to complete vocational assignments,
- increased the amount that mathematics teachers used best instructional practices,
- increased the amount that science teachers used best instructional practices (only true for new *HSTW* schools),

- increased the percentage of students who took a mathematics class during their senior year by 14 percent for new schools and 11 percent for experienced schools,
- increased the percentage of students who took a science class during their senior year by nine percent for new schools and 11 percent for experienced schools,
- increased the amount of time that students spent on homework, and
- increased by six percent in both new and experienced schools the percentage of students who received help from someone in their school in developing a four-year educational plan.

Table 12. Changes in the Levels of Implementation of the Indicators in New *HSTW* Schools in 1996 and 1998: Student Reports

Indicators from Student Reports Higher score = better implementation (See Appendix A.)	New Sites N = 223		Goal
	Average 1996	Average 1998	
Vocational Teachers Stress Academic Skills	2.29	2.31	3
Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments	2.78	2.85***	4
Use of Best Instructional Practices in Mathematics Courses	2.45	2.66***	7
Use of Best Instructional Practices in Science Courses	2.80	2.87*	5
Use of Best Instructional Practices in English Courses	3.01	2.94*	5
Use of Mathematics in an Applied Context	1.96	1.99	3
Use of Science in an Applied Context	2.28	1.99***	3
Percentage of Students Who Took a Mathematics Course in Their Senior Year of High School	45	59***	100
Percentage of Students Who Took a Science Course in Their Senior Year of High School	33	42***	100
Amount of Time Students Spend on Homework Each Day	1.62	1.70***	2 or higher
Percentage of Students Who Received Help from Their School in Developing a Four-Year Educational Plan	62	68***	100

***$p \leq .001$, *$p \leq .05$. Probability for paired t-tests.

Table 13. Changes in the Levels of Implementation of the Indicators in Experienced *HSTW* Schools in 1996 and 1998: Student Reports

Indicators from Teacher Reports Higher score = better implementation (See Appendix A.)	Experienced Sites N = 170		Goal
	Average 1996	Average 1998	
Vocational Teachers Stress Academic Skills	2.31	2.32	3
Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments	2.85	2.89*	4
Use of Best Instructional Practices in Mathematics Courses	2.56	2.61	7
Use of Best Instructional Practices in Science Courses	2.89	2.83	5
Use of Best Instructional Practices in English Courses	3.04	2.88***	5
Use of Mathematics in an Applied Context	2.02	1.95**	3
Use of Science in an Applied Context	2.32	1.95***	3
Percentage of Students Who Took a Mathematics Course in Their Senior Year of High School	48	59***	100
Percentage of Students Who Took a Science Course in Their Senior Year of High School	35	46***	100
Amount of Time Students Spend on Homework Each Day	1.62	1.67**	2 or higher
Percentage of Students Who Received Help from Their School in Developing a Four-Year Educational Plan	68	74***	100

***$p \leq .001$, ** $p \leq .01$, *$p \leq .05$. Probability for paired t-tests.

Of the other indicators, for new schools, levels of implementation remained the same for:

- vocational teachers stressing academic skills; and
- using mathematics in an applied context.

For experienced schools, levels of implementation remained the same for:

- Vocational Teachers Stress Academic Skills;
- Use of Best Instructional Practices in Mathematics Courses; and
- Use of Best Instructional Practices in Science Courses.

For new schools, levels of implementation decreased for:

- using best instructional practices in English courses; and

- using science in an applied context.

For experienced schools, levels of implementation decreased for:

- using best instructional practices in English courses,
- using mathematics in an applied context, and
- using science in an applied context.

The fact that both new and experienced schools showed increases in many indicators is positive; it shows that schools can implement changes early in their involvement with *HSTW* and can continue to improve their implementation after being in *HSTW* for several years.

Key points regarding implementation. The analyses show that in 1996 both new and experienced schools were doing well on three of the indicators from the teacher surveys:

- Importance Placed on Encouraging Student Success;
- Supportive Instructional Environment; and
- Teacher Emphasis on Basic Learning Skills.

However, both new and experienced schools fell below the goals on four of the indicators from the teacher survey:

- School Expectations for Vocational Students;
- Administrators' Expectations that Vocational Teachers Will Integrate Academics in Their Classes;
- Academic and Vocational Teachers Meet as a Team; and
- Increase in Use of Best Instructional Practices.

In addition, both new and experienced schools fell short of the goals set for all of the student indicators.

As expected, new schools in the *HSTW* initiative successfully increased their implementation of most of the indicators measured in the teacher surveys between 1996 and 1998. Experienced schools increased their implementation on some of the indicators, but not on as many of them as the new

schools did. An encouraging fact is that new schools increased the implementation of three out of the four indicators on which they fell below the goal in 1996:

- School Expectations for Vocational Students;
- Administrators' Expectations that Vocational Teachers Will Integrate Academics in Their Classes; and
- Increase in the Use of Best Instructional Practices Since Beginning *HSTW*.

Experienced schools increased the implementation of two out of the four indicators on which they fell below the goal in 1996:

- School Expectations for Vocational Students; and
- Increase in the Use of Best Instructional Practices Since Beginning *HSTW*.

Experienced schools decreased in the implementation of one indicator – *Frequency With Which Academic and Vocational Teachers Meet as a Team.*

Although both new and experienced schools fell below the goals on all indicators in 1996, they increased their implementation of about half of the indicators by 1998. By 1998 new and experienced schools had increased their implementation of the following indicators:

- Vocational Teachers Emphasize Using Academic Skills to Complete Vocational Assignments;
- Use of Best Instructional Practices in Mathematics Courses;
- Use of Best Instructional Practices in Science Courses (only true for new *HSTW* schools);
- Percentage of Students Who Took a Mathematics Course in Their Senior Year of High School;
- Percentage of Students Who Took a Science Course in Their Senior Year of High School;
- Amount of Time Students Spend on Homework Each Day; and
- Percentage of Students Who Received Help from Their school in Developing a Four-Year Educational Plan.

What Was the Relationship Between Implementation of the Indicators and Student Achievement?

According to teacher surveys, what was the relationship between *HSTW* implementation and student achievement? This section of the paper addresses the question of whether a greater change in the *HSTW* implementation is related to greater changes in student achievement. First, we address students' scores on the NAEP-based achievement tests; then we address students' completion of the *HSTW*-recommended courses.

NAEP-based Achievement Tests. Between 1996 and 1998, 11 percent more students per school met the achievement goal in mathematics, four percent more students met the goal in science, and eight percent more students met the goal in reading. We conducted multiple regressions (one each in mathematics, science and reading) to examine the relationship between the implementation of the indicators from the teacher data set and the increase in the percent of students meeting the mathematics, science and reading achievement goals. In these analyses, we controlled for changes in two variables related to academic success: 1) parental educational attainment and 2) percentage of minority students in the school. (See Appendix B for a complete model.)[11]

The most interesting finding from these analyses is that an increase in the percentage of seniors who completed the *HSTW* program of study in each academic area (reading, mathematics and science) was significantly related to an increase in the percentage of seniors who met the achievement goal in that area.. (See Figures 2, 3 and 4.) For all three academic areas, schools that had larger increases in the number of students who completed the *HSTW* program of study in the relevant academic area between 1996 and 1998 also had a larger increase in the number of students who met the achievement goals in those areas.

Two other indicators were significant predictors in reading:

- Teacher Emphasis on Basic Learning Skills was related negatively to an increase in the number of students meeting the reading achievement goal.
- An Increase in the Use of Best Instructional Practices Since Beginning *HSTW* was related positively to an increase in the number of students meeting the reading achievement goal.

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[11] The changed scores used in these analyses were created by subtracting the 1996 score for each indicator or outcome from the 1998 score.

Figure 2. Relationship Between Teacher Indicators and Student Achievement in Mathematics

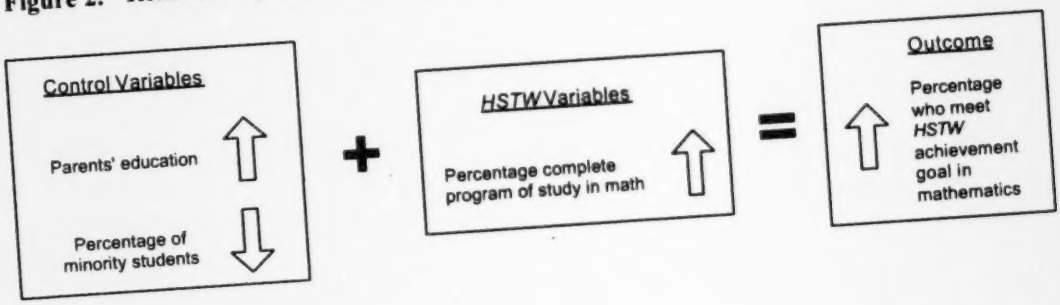


Figure 3. Relationship Between Teacher Indicators and Student Achievement in Science

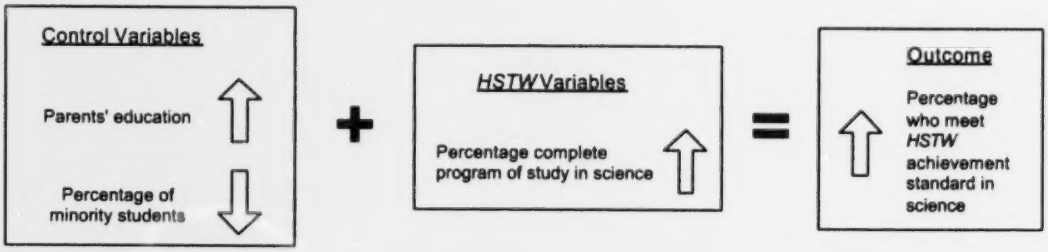
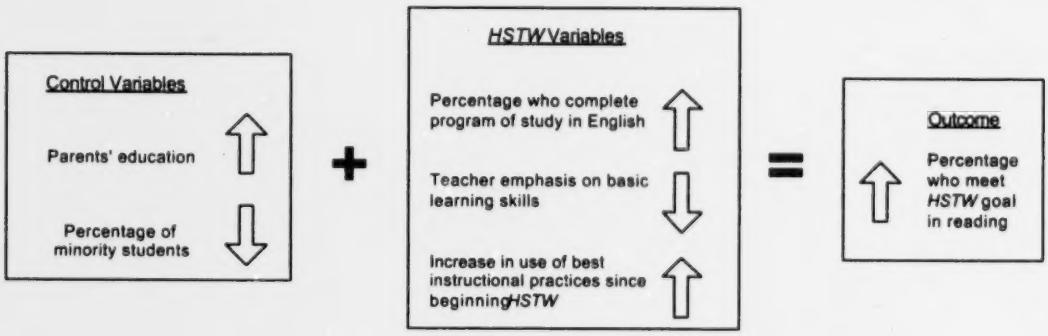


Figure 4. Relationship Between Teacher Indicators and Student Achievement in Reading


Control Variables
Parents' education
Percentage of minority students
+
HSTW Variables
Percentage who complete program of study in English
Teacher emphasis on basic learning skills
Increase in use of best instructional practices since beginning HSTW
=
Outcome
Percentage who meet HSTW goal in reading

It is unclear why *Teacher Emphasis on Basic Learning Skills* was negatively related to the outcome; it does not have a significant zero-order correlation with the outcome variable. The result might be due to a high correlation with another variable in the regression; when the other variable is left out of the regression *Teacher Emphasis on Basic Learning Skills* was no longer a significant predictor of outcome.

Program of Study. Because completing the *HSTW* program of study was so strongly and consistently related to meeting the *HSTW* achievement goals for all three academic areas, we also examined predictors of completing the *HSTW*-recommended program of study. Did changes in the implementation of any of the indicators relate to increases in the number of students who completed the program of study? To answer this question, we conducted separate multiple regression analyses in each academic area to examine the relationship between increases in implementation in the indicators and increases in the percentage of students who completed the *HSTW* program of study in each academic area.

However, none of the teacher indicators was related to increases in the recommended courses. (See Appendix B for the complete model.) We are not surprised at this low level of significant findings in predicting students' course-taking patterns. Students need three to four years of course work to complete the program of study, so changes in school practices might not translate into an increase in the course-taking patterns for several years. For example, if a change in school practices influences an 11th-grader to take an additional mathematics course, this one course might not be enough additional mathematics for this student to meet the mathematics course-taking recommendations.

According to student surveys, what is the relationship between *HSTW* implementation and student achievement? This section of the paper addresses the question of whether an increase in implementation of the key practices is related to increases in student achievement. First we address students' scores on the NAEP-based achievement tests, then we address students' completion of the *HSTW* program of study.

NAEP-based Achievement Tests. We conducted three multiple regression analyses to explore whether increases in implementation of the student indicators were related to increases in the percentages of students who met *HSTW*'s achievement goals in mathematics, science and reading between 1996 and 1998. As with the teacher analyses, we controlled for changes in two variables related to academic success: 1) parental educational attainment and 2) percentage of minority students in the school.

Several predictors were significant in all three academic areas. (See Figures 5, 6 and 7; see Appendix B for the complete model.) In mathematics, science and reading, increases in the following indicators were significant predictors of increases in the percentage of students who met the *HSTW* achievement goal:

- Vocational Teachers Emphasize Using Academics for Vocational Assignments, and
- Amount of Time Students Spend on Homework Each Day.

For both mathematics and reading, increases in the percentage of students who completed the *HSTW*-recommended program of study were significant predictors of increases in meeting the achievement goal. For mathematics only, increases in the percentage of students who received help from their

school in developing a four-year educational plan were related to increases in meeting the achievement goal.

Figure 5. Relationship Between Student Indicators and Student Achievement in Mathematics

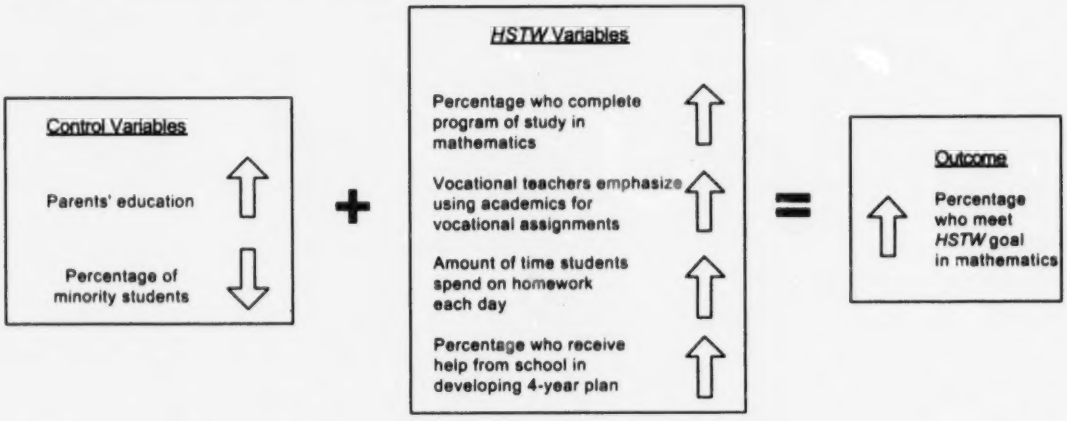

Control Variables
Parents' education
Percentage of minority students
+
HSTW Variables
Percentage who complete program of study in mathematics
Vocational teachers emphasize using academics for vocational assignments
Amount of time students spend on homework each day
Percentage who receive help from school in developing 4-year plan
=
Outcome
Percentage who meet HSTW goal in mathematics

Figure 6. Relationship Between Student Indicators and Student Achievement in Science

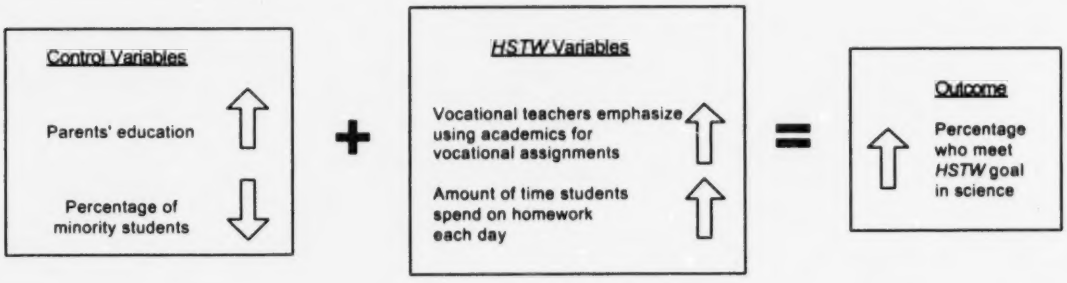
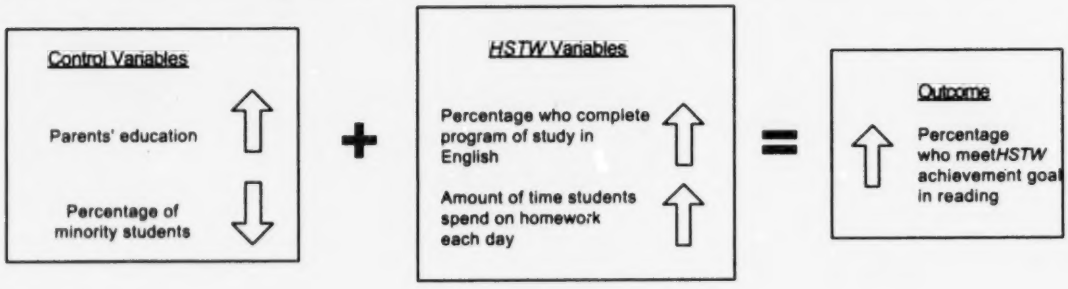


Figure 7. Relationship Between Student Indicators and Student Achievement in Reading



What Was the Relationship Between Implementation of the Indicators and Completion of the Program of Study?

Since meeting the *HSTW* program of study was related to meeting the NAEP-based achievement goals for both mathematics and reading, we also examined whether any of the student indicators predicted completing the *HSTW* program of study in 1998. Were increases in implementation of any of the indicators related to increases in the number of students who completed the *HSTW* program of study?

For both mathematics and science, increases in the percentage of students who took an academic course in the relevant area were related to increases in the percentage of students who completed the *HSTW*-recommended program of study. For English, an increase in the use of best instructional practices in English courses was related to an increase in the percentage of students who completed the *HSTW* program of study in English. (See Figures 8, 9 and 10.)

Figure 8. Relationship Between Student Indicators and Completion of Program of Study in Mathematics

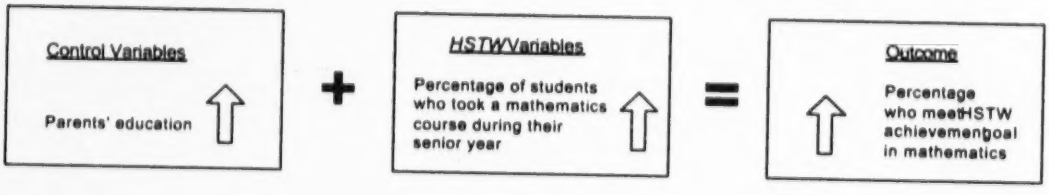


Figure 9. Relationship Between Student Indicators and Completion of Program of Study in Science

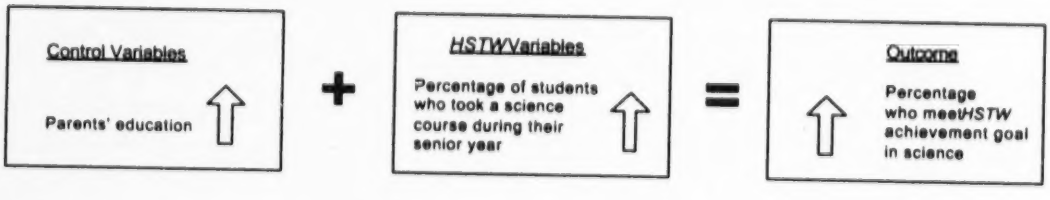
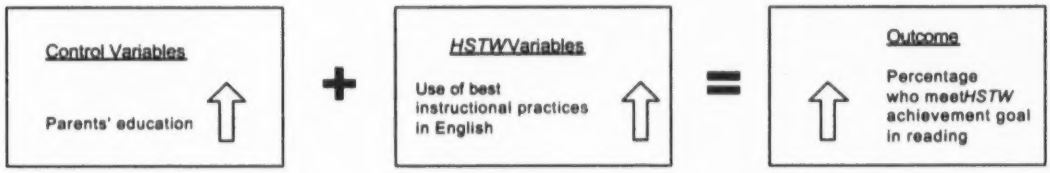


Figure 10. Relationship Between Student Indicators and Completion of Program of Study in English



Key points on the relationship between implementation and student achievement. In both the teacher and student data, the significant relationship between the percentage of students who completed *HSTW*'s recommended curriculum and the percentage of students who met *HSTW*'s achievement goals in all three academic areas (with the exception of the student model in science) supports the hypothesis that completing the recommended courses relates to higher scores on the NAEP-based achievement tests. The only other teacher indicator that positively predicted meeting the *HSTW* achievement goal was that an increase in the use of best instructional practices since beginning *HSTW* was related to an increase in the percentage of students who met *HSTW*'s achievement goal in reading.

In the student data, there were two additional significant predictors of schools' increasing the percentage of students who met *HSTW*'s achievement goals in all three academic areas: 1) vocational teachers emphasizing the use of academics for vocational assignments and 2) the amount of time students spent on homework. In addition, the percentage of student who said they received help from the school in developing a four-year educational plan predicted an increase in mathematics test scores.

There were two predictors of increases in the percentages of students completing the *HSTW* course recommendations. In mathematics and science, an increase in the percentage of students in a school who took either a mathematics or a science course in their senior year of high school was a significant predictor. In English, an increase in the use of best instructional practices in English courses was a significant predictor.

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CONCLUSION

These analyses allow us to find support for many theoretical hypotheses based on the *High Schools That Work* model. Although this type of non-experimental analysis cannot allow us to conclude definitively that *HSTW* is the cause of any school improvement, it can allow us to find support for the hypothesis that *HSTW* is the cause of school improvement, although other non-measured factors may also influence these schools. The limitation of this research is that without the use of a control group (i.e., similar schools that did not participate in the *HSTW* initiative), we cannot confirm that these changes would not have occurred without *HSTW* or that they are related to the *HSTW* practices.

These analyses show that in the two-year period between 1996 and 1998, *HSTW* schools significantly increased the percentages of students in their senior classes who met the *HSTW* achievement goals in mathematics, science and reading and the percentages of students in their senior classes who completed the *HSTW*-recommended program of study.

Based on the differences between schools in 1996 and 1998 and the differences between new and experienced *HSTW* schools, we found ample evidence that many of the *HSTW* practices are being implemented. Both the longitudinal analysis and the analysis comparing new and experienced schools showed many changes related to participating in *HSTW*. In addition, the illumination of aspects of the initiative in which schools did not show change can be used to inform schools of areas they should focus on, as well as acting as an impetus to make any necessary changes in the technical assistance given to the schools.

We also found evidence to support the hypothesis that meeting the *HSTW* curricular standards is related to meeting the achievement goals. The higher the increase in the percentage of students at a school who complete the *HSTW*-recommended curriculum, the higher the increase in the percentage of students in that school who meet the *HSTW* achievement goals. Furthermore, it seems that increases in the use of best instructional practices, in vocational teachers' emphasizing using academic skills for vocational assignments, in the amount of time students spend on homework and in the percentages of students who receive help from the school in developing a four-year educational plan are also related to an increase in the percentage of students' meeting achievement goals. Analyses also showed that

schools that had an increase in the percentage of students who took a mathematics or science course in senior year also had an increase in the percentage of students completing the *HSTW* curriculum in those academic areas.

In sum, this research provides support for the hypothesis that *High Schools That Work* produces school changes related to the *HSTW* key practices. The research also found support for the hypothesis that completing the *HSTW* recommended curriculum is related to meeting the achievement goals.

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APPENDIX A

Teacher Indicators

1. School Expectations for Vocational Students

   Single Item: Please select the response which best describes the standards and expectations your school has for students who are planning to enter the work force, a two-year college or technical school, an apprenticeship program, or the military upon high school graduation.

   Response options:
   3 = Our high school expects these students to meet the same standards in English, mathematics and science that are expected of students planning to enter directly a four-year college.

   2 = Our high school expects these students to master only the content in English, mathematics and science most needed for further study in a work or educational setting.

   1 = Our high school expects these students to enroll in lower-level courses in English, mathematics and science, which accommodate their abilities.

2. Importance Placed on Encouraging Student Success (1996 a = .88, 1998 a = .89)

   Items: How important are the following goals in your high school?

   - Help students in their social development by stressing the ability to get along with and understand all people
   - Help all high school students master the essential content taught in college-preparatory language arts, mathematics and science courses
   - Help students make realistic plans for what they will do after graduation
   - Help students pursue a program of high school studies that will enable them to achieve their plans
   - Develop students' abilities to solve problems and think critically
   - Prepare *all* students for further learning
   - Encourage students' use of high-level academic content – language arts, mathematics and science – in solving real-world tasks and problems
   - Help students gets through high school

   Response options:
   4 = Very important
   3 = Important
   2 = Not too important
   1 = Not at all important

3. Supportive Instructional Environment[12] (1996 a = .86, 1998a =.85)

Items: Using the scale below, indicate the extent to which you agree or disagree with each of the following statements about your school.

- Goals and priorities for this school are clear.
- The staff is continually evaluating its program and activities.
- Teachers in this school are continually learning and seeking new ideas.
- The principal consults with staff members before making decisions that affect us.
- In this school I am encouraged to experiment with my teaching.
- The surrounding community actively supports our instructional efforts.
- The teachers and school administration work together to improve the achievement of students in this school.
- I am familiar with the content and specific goals of the courses taught by other teachers in this high school.
- Teachers in this school maintain a demanding yet supportive environment that pushes students to do their best.

Response options:
4 = Agree strongly
3 = Agree somewhat
2 = Disagree somewhat
1 = Disagree strongly

4. Administrators' Expectations that Vocational Teachers Will Integrate Academics into Their Classes (1996 a = .80, 1998 a = .79)

Items: To what extent do your school and district administrators expect you to do the following?

- Require students to read and comprehend technical material in your field of study
- Require students to use concepts from geometry, algebra or higher-level mathematics to solve problems in your field of study
- Require students to apply scientific principles to solve problems and explain concepts in your field of study

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[12]"Importance Placed on Encouraging Student Success" and "Supportive Instructional Environment" are the two subscales of the scale "School Climate" (1996 a = .90, 1998 a = .90).

Response Options:
4 = A great deal
3 = To some extent
2 = Very little
1 = None

5. Teacher Emphasis on Basic Learning Skills (1996 a = .72, 1998 a = .59)

Items: In addition to specific course skills, how often do you emphasize the following characteristics by grading your students on them?

- Reading and understanding written and verbal instructions (1998 = Reading and understanding what they have read)
- Developing the capacity to concentrate (not asked in 1998)
- Learning mathematics well (1998 = Demonstrating complex mathematical skills)
- Doing arithmetic calculations
- Having disciplined work habits (1998 = Disciplined work habits)
- Learning to write well (1998 = Writing well)
- Learning how to solve complex problems (1998 = Solving complex problems)

Response Options:
4 = Constantly
3 = Often
2 = Seldom
1 = Never

6. Academic and Vocational Teachers Meet as a Team

Single Item: How often do you meet as a member of a team of academic and vocational teachers to plan collaborative instructional activities and to take collective responsibility for student learning?

Response Options:
5 = My team meets more than once per week for this purpose
4 = My team meets once per week for this purpose
3 = My team meets once per month for this purpose
2 = I have met once this year for this purpose
1 = I do not attend any such meeting (1998 = I have not attended any such meeting this year)

7. Increase in Use of Best Instructional Practices Since Beginning *HSTW* (1996 a = .84, 1998 a = .85)

Items: To what extent have the following practices changed since your school became an SREB *High Schools That Work* site?

- Your expectations for student performance (1998 = Expecting high-quality products and performances from students)
- Using lecture format in class (reverse coded, same in 1998)
- Engaging students in learning activities that involve academic content (same in 1998)
- Amount of time students work in small groups on assignments (1998 = Students working in small groups on assignments)
- Using manipulatives and hands-on experiments or projects to make content more concrete (same in 1998)
- Having students do joint assignments in which students work with an academic and a vocational teacher (1998 = Students doing joint assignments in which they work with an academic and a vocational teacher)
- Amount of homework assigned and reviewed (same in 1998)
- Amount of time students write to clarify and communicate their ideas (1998 = Having students write to clarify and communicate their ideas)
- Amount of time students use mathematics to solve challenging real-world problems (1998 = Asking students to use mathematics to solve challenging real-world problems)
- Amount of time students spend on assigned reading (same in 1998)
- Amount of time students spend writing business or technical documents or research papers (1998 = Students creating written reports, research papers and work plans)
- Compelling students to take greater responsibility for their learning (1998 = Students taking greater responsibility for their learning)

Response options:

5 = Much more
3 = No change
1 = Much less

Student Indicators

1. Vocational Teachers Stress Academic Skills (1996 a = .70, 1998 a = .70)

   Items: Which best describes the importance given by your vocational teachers to the following skills?

   - Reading
   - Writing
   - Mathematics
   - Science

   Response Options:
   3 = Often Stressed
   2 = Seldom Stressed
   1 = Never Stressed

2. Vocational Teachers Emphasize Using Academic Skills for Vocational Assignments (1996 a = .64, 1998 a = .58)

   Items: What best describes the amount of emphasis your vocational teachers placed on the following activities?

   - Using mathematics to complete specific assignments in my vocational area
   - Reading and interpreting technical books and manuals in completing assignments in my vocational area
   - Using scientific principles to explain particular systems or processes in my vocational area (not asked in 1998)

   Response Options:
   4 = Required Daily or Weekly
   3 = Required Monthly or Several Times a Year
   2 = Required Once or Twice a Year
   1 = Never Required

3. Use of Best Instructional Practices in Mathematics Courses (1996 a = .66, 1998 a = .69)

   Items: Which best describes the approximate extent to which you did each of the following activities in your high school mathematics classes?

   - Stood before the class and made an oral presentation about a special mathematics project (1998 = Stood before the class and made an oral presentation about a special mathematics project using visuals or other props) Goal = 2
   - Used a computer to complete mathematics assignments (same in 1998) Goal = 3

- Used a graphing calculator to complete mathematics assignments (same in 1998) Goal = 3
- Completed a joint mathematics assignment for my mathematics and vocational teachers, for which I received a grade in both classes (same in 1998) Goal = 2
- Completed a written report on a major mathematics project (same in 1998) Goal = 2
- Orally defended a process that I used to solve a mathematics problem (same in 1998) Goal = 3
- Worked with one or more students in my class on a challenging mathematics assignment (same in 1998) Goal = 3

Response Options:
4 = Required Daily or Weekly
3 = Required Monthly or Several Times a Year
2 = Required Once or Twice a Year
1 = Never Required

4. Use of Best Instructional Practices in Science Courses (1996 a = .67, 1998 a = .70)

Items: Which best describes the approximate extent to which you did each of the following activities in your high school science classes?

- Stood before the class and reported on a completed science project (1998 = Stood before the class and reported on a completed science project using laboratory equipment, visuals or other props) Goal = 2
- Read an assigned book or article dealing with science (same in 1998) Goal = 3
- Completed a science project jointly assigned by a science and vocational teacher for which I received a grade in both classes (same in 1998) Goal = 2
- Prepared a written report on a science project (same in 1998) Goal = 2
- Worked with one or more students in my class on a challenging science assignment (same in 1998) Goal = 3

Response Options:
4 = Required Daily or Weekly
3 = Required Monthly or Several Times a Year
2 = Required Once or Twice a Year
1 = Never Required

5. Use of Best Instructional Practices in English Courses (1996 a = .61, 1998 a = .67)

Items: Which best describes the approximate extent to which you did each of the

following activities in your high school English classes?

- Wrote a major research paper (1998 = Wrote a major research paper on a subject I chose) Goal = 2
- Read an assigned book outside class (1998 = Read an assigned book outside class and demonstrated that I understood the significance of the main ideas) Goal = 3
- Stood before the class and made an oral presentation on a project or assignment (1998 = Stood before the class and made an oral presentation on a project or assignment using props, visuals or skits to meet specific requirements of quality) Goal = 2
- Completed a joint writing assignment for English and vocational teachers for which I received a grade in both classes (same in 1998) Goal = 2
- Completed short writing assignments of one to three pages for which I received a grade (same in 1998) Goal = 4

Response Options:
4 = Required Daily or Weekly
3 = Required Monthly or Several Times a Year
2 = Required Once or Twice a Year
1 = Never Required

6. Use of Mathematics in an Applied Context

Single Item: Which best describes the approximate extent to which you did each of the following activities in your high school mathematics classes?

- Completed a special mathematics project that required using mathematics in ways that most people would use mathematics in a work setting

Response Options:
4 = Required Daily or Weekly
3 = Required Monthly or Several Times a Year
2 = Required Once or Twice a Year
1 = Never Required

7. Use of Science in an Applied Context

Single Item: Which best describes the approximate extent to which you did each of the following activities in your high school science classes?

- Completed a science lab assignment in which I used science to address a problem found in my community or a work setting

Response Options:
4 = Required Daily or Weekly
3 = Required Monthly or Several Times a Year
2 = Required Once or Twice a Year
1 = Never Required

8. Percentage of Students Who Took Mathematics in Their Senior Year of High School

Single Item: Are you currently taking a class in any of the following subjects? (1998 = Are you currently taking a class or have you taken a class during your senior year in any of the following subjects?)

- Mathematics

Response Options: 1 = yes
0 = no

9. Percentage of Students Who Took Science in Their Senior Year of High School

Single Item: Are you currently taking a class in any of the following subjects? (1998 = Are you currently taking a class or have you taken a class during your senior year in any of the following subjects?)

- Science

Response Options: 1 = yes
0 = no

10. Amount of Time Students Spend on Homework Each Day

Item: How much time do you usually spend on homework each day?

Response Options: 1 = ½ hour or less
2 = 1 hour
3 = 2 hours
4 = More than 2 hours

11. Percentage of Students Who Receive Help from Their School in Developing a Four-Year Educational Plan

Item: Who helped you develop a four-year educational plan outlining the high school courses you should take?

Response Options: 1 = A guidance counselor, or a teacher, or a teacher and a guidance counselor
0 = No one helped me, or I did not have an educational plan for high school

APPENDIX B

Table B-1. Teacher Indicators that Predict the Increase in the Percentage of Seniors Who Met *HSTW* Achievement Goals

Dependent Variable	Increase in Percentage of Students Who Met the Goal on the Mathematics Test (R^2 = .20)		Increase in Percentage of Students Who Met the Goal on the Science Test (R^2 = .10)		Increase in Percentage of Students Who Met the Goal on the Reading Test (R^2 = .14)	
Independent Variable	**Standardized Coefficient (ß)**	**Unstandardized Coefficient (*B*)**	**Standardized Coefficient (ß)**	**Unstandardized Coefficient (*B*)**	**Standardized Coefficient (ß)**	**Unstandardized Coefficient (*B*)**
School's average parental educational attainment	.16	.11	.16	.11	.13	.10
Percentage of minority students	-.11	-.15	-.25	-.36	-.14	-.26
Percentage of seniors who completed the *HSTW* program of study in the relevant academic area (mathematics, science or English)	.38	.30	.13	.08	.27	.22
School expectations for vocational students compared with college-prep students	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
School Climate	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Administrators' expectations that vocational teachers integrate academics into their classes	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Teacher emphasis on basic learning skills	(ns)	(ns)	(ns)	(ns)	-.11	-.16
Frequency with which academic and vocational teachers meet as a team	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Increase in use of best instructional practices since beginning *HSTW*	(ns)	(ns)	(ns)	(ns)	.15	.18

Interpretations: The model R^2 for each regression analysis indicates the proportion of variance in the outcome variable that can be explained by the set of independent variables. The t-test associated with each independent variable tests that variable's unique contribution to the overall R^2. Standardized coefficients can only be compared with each other within an academic area. Non-standardized coefficients for the same independent variable can be compared across academic areas. Source: All data for the independent variables are from the 1996 Teacher Survey of the *HSTW* Assessment, with the exception of average parental educational attainment and percentage of minority students.

Note: Mathematics N = 385, Science N = 385, English N = 384, ns = non-significant at the .05 level. All others significant at $p \leq .05$.

Table B-2. Teacher Indicators that Predict the Increase in the Percentage of Seniors Who Completed the *HSTW* Program of Study

Independent Variable	Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in Math (R^2 = .05)		Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in Science (R^2 = .04)		Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in English (R^2 = .07)	
	Standardized Coefficient (ß)	Unstandardized Coefficient (*B*)	Standardized Coefficient (ß)	Unstandardized Coefficient (*B*)	Standardized Coefficient (ß)	Unstandardized Coefficient (*B*)
School's average parental educational attainment	.27	.23	.22	.24	.27	.27
Percentage of minority students	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
School expectations for vocational students compared with college-prep students	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
School Climate	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Administrators' expectations that vocational teachers integrate academics into their classes	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Teacher emphasis on basic learning skills	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Frequency with which academic and vocational teachers meet as a team	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Increase in use of best instructional practices since beginning *HSTW*	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)

Interpretations: The model R^2 for each regression analysis indicates the proportion of variance in the outcome variable that can be explained by the set of independent variables. The t-test associated with each independent variable tests that variable's unique contribution to the overall R^2. Standardized coefficients can only be compared with each other within an academic area. Non-standardized coefficients for the same independent variable can be compared across academic areas. Source: All data for the independent variables are from the 1996 Teacher Survey of the *HSTW* Assessment, with the exception of average parental educational attainment and percentage of minority students.

Note: Mathematics N = 386, Science N = 385, English N = 385, ns = non-significant at the .05 level. All others significant at $p \leq .05$.

Table B-3. Student Indicators that Predict the Increase in the Percentage of Seniors Who Met *HSTW* Achievement Goals

Dependent Variables	Increase in the Percentage of Students Who Met the Goal on the Mathematics Test (R^2 = .29)		Increase in the Percentage of Students Who Met the Goal on the Science Test (R^2 = .17)		Increase in the Percentage of Students Who Met the Goal on the Reading Test (R^2 = .19)	
Independent Variable	Standardized Coefficient (ß)	Unstandardized Coefficient *(B)*	Standardized Coefficient (ß)	Unstandardized Coefficient *(B)*	Standardized Coefficient (ß)	Unstandardized Coefficient *(B)*
School's average parental educational attainment	.16	.11	.17	.11	.11	.09
Percentage of minority students	-.10	-.15	-.24	-.35	-.17	-.30
Percentage of seniors who completed the *HSTW* program of study in the relevant academic area (mathematics, science or English)	.35	.27	(ns)	(ns)	.22	.19
Vocational teachers stress academic skills	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Vocational teachers emphasize using academics for vocational assignments	.23	.14	.19	.11	.10	.07
Use of best instructional practices in courses in the relevant academic area (mathematics, science or English)	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Use of mathematics in an Applied Context	(ns)	(ns)	(ns)	(ns)	NA	NA
Percentage of Students Who Took A Course in the Relevant Academic Area (mathematics or science) in Their Senior Year of High School	(ns)	(ns)	(ns)	(ns)	NA	NA
Amount of time students spend on homework each day	.14	.08	.10	.06	.23	.17
Percentage of students who receive help from their school in developing a four-year educational plan	.10	.10	(ns)	(ns)	(ns)	(ns)

Interpretations: The model R^2 for each regression analysis indicates the proportion of variance in the outcome variable that can be explained by the set of independent variables. The t-test associated with each independent variable tests that variable's unique contribution to the overall R^2. Standardized coefficients can only be compared with each other within an academic area. Non-standardized coefficients for the same independent variable can be compared across academic areas. Source: All data for the independent variables are from the 1996 Student Survey of the *HSTW* Assessment.

Note: Mathematics N = 389, science N = 388, English N = 388, ns = non-significant at the .05 level. All others significant at $p \leq .05$; NA = this indicator was not asked for this academic area.

Table B-4. Student Indicators that Predict the Increase in the Percentage of Seniors Who Completed the *HSTW* Program of Study

Dependent Variable	Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in Math (R^2 = .13)		Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in Science (R^2 = .08)		Increase in the Percentage of Students Who Completed the *HSTW* Program of Study in English (R^2 = .11)	
Independent Variable	**Standardized Coefficient (ß)**	**Unstandardized Coefficient *(B)***	**Standardized Coefficient (ß)**	**Unstandardized Coefficient *(B)***	**Standardized Coefficient (ß)**	**Unstandardized Coefficient *(B)***
School's average parental educational attainment	.20	.17	.21	.23	.25	.25
Percentage of minority students	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Percentage of seniors who completed the *HSTW* program of study in the relevant academic area (mathematics, science or English)	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Vocational teachers stress academic skills	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Vocational teachers emphasize using academics for vocational assignments	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)
Use of best instructional practices in courses in the relevant academic area (mathematics, science or English)	(ns)	(ns)	(ns)	(ns)	.18	.11
Use of Mathematics in an Applied Context	(ns)	(ns)	(ns)	(ns)	NA	NA
Percentage of Students Who Took a Course in the Relevant Academic Area (mathematics or science) in Their Senior Year of High School	.26	.25	.15	.20	NA	NA
Amount of time students spend on homework each day	(ns)	(ns)	(ns)	(ns)	(ns)	(ns)

Interpretations: The model R^2 for each regression analysis indicates the proportion of variance in the outcome variable that can be explained by the set of independent variables. The t-test associated with each independent variable tests that variable's unique contribution to the overall R^2. Standardized

coefficients can only be compared with each other within an academic area. Non-standardized coefficients for the same independent variable can be compared across academic areas. Source: All data for the independent variables are from the 1996 Student Survey of the *HSTW* Assessment.

Note: Mathematics N = 390, science N = 389, English N = 389, ns = non-significant at the .05 level. All others significant at $p \leq .05$.

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